

WHAT IS CLAIMED IS:

1. A method for forming metal wiring in a semiconductor device, the method comprising the steps of:

5 forming a TiN thin layer on a semiconductor substrate by using Ti compound containing a halogen element and NH_3 reactant and adsorbing halogen atoms to the surface of the TiN thin layer; and

forming a metal layer on the TiN thin layer by using the
10 adsorbed halogen atoms as catalyst.

2. The method for forming metal wiring in a semiconductor device as set forth in claim 1, wherein the metal layer is made from Copper.

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3. The method for forming metal wiring in a semiconductor device as set forth in claim 2, wherein the metal layer is formed in situ after formation of the TiN thin layer by selectively using one of a group including
20 hexafluoroacetyl-acetonate Cu vinyltrimethyl-silane reactant, $\text{Cu}(\text{hfac})_2$, $(\text{hfac})\text{Cu}(\text{COD})$ and $(\text{hfac})(\text{Cu})(\text{ATMS})$.

4. The method for forming metal wiring in a semiconductor device as set forth in claim 1, wherein the

step of forming a thin layer is applied to a contact hole pattern or a trench pattern.

5. The method for forming metal wiring in a semiconductor device as set forth in claim 2, wherein the copper layer is deposited via Chemical Vapor Deposition (CVD).

6. The method for forming metal wiring in a semiconductor device as set forth in claim 1, wherein the metal layer is made from at least one consisting of tungsten, aluminum, and tantalum.

7. The method for forming metal wiring in a semiconductor device as set forth in claim 1, wherein the halogen element includes iodine (I), fluorine (F), chlorine (Cl), bromine (Br) and astatine (At) of group XVII elements in the periodic table.

8. The method for forming metal wiring in a semiconductor device as set forth in claim 2, wherein the TiN thin layer and the Cu layer are formed at a temperature of about 100 to 300°C under a pressure of about 0.1 to 10 torr.

9. The method for forming metal wiring in a

semiconductor device as set forth in claim 1, wherein the Ti compound and the NH_3 reactant are injected simultaneously or sequentially in the form of Atomic Layer Deposition (ALD).

5 10. The method for forming metal wiring in a semiconductor device as set forth in claim 1, wherein the TiN thin layer is formed using plasma.

11. The method for forming metal wiring in a
10 semiconductor device as set forth in claim 1, wherein the Ti compound includes TiI_4 , wherein the adsorbed halogen element is I.

12. The method for forming metal wiring in a
15 semiconductor device as set forth in claim 2, wherein the TiN thin layer and the Cu layer are deposited in a single chamber.

13. A method for forming metal wiring in a semiconductor device, the method comprising the steps of:
20 forming an insulation layer on a semiconductor substrate and a contact hole in the insulation layer;

 forming a TiN thin layer on the insulation layer including the contact hole by using Ti compound and NH_3 reactant and adsorbing halogen atoms to the surface of the

TiN thin layer; and

forming a copper layer on the TiN thin layer by using the adsorbed halogen atoms as catalyst to fill the contact hole.

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14. The method for forming metal wiring in a semiconductor device as set forth in claim 13, wherein the copper layer is formed in situ after formation of the TiN thin layer by selectively using one of a group including
10 hexafluoroacethyl-acetonate Cu vinyltrimethyl-silane reactant, Cu(hfac)₂, (hfac)Cu(COD) and (hfac)(Cu)(ATMS).

15. The method for forming metal wiring in a semiconductor device as set forth in claim 13, wherein the
15 halogen element includes iodine (I), fluorine (F), chlorine (Cl), bromine (Br) and astatine (At) of group XVII elements in the periodic table.

16. The method for forming metal wiring in a
20 semiconductor device as set forth in claim 13, wherein the TiN thin layer and the Cu layer are formed at a temperature of about 100 to 300°C under a pressure of about 0.1 to 10 torr.

17. The method for forming metal wiring in a

semiconductor device as set forth in claim 13, wherein the Ti compound and the NH_3 reactant are injected simultaneously or sequentially in the form of Atomic Layer Deposition (ALD).

- 5 18. The method for forming metal wiring in a semiconductor device as set forth in claim 13, wherein the Ti compound includes TiI_4 , wherein the adsorbed halogen element is I.